

DURATION OF SMOKELESS TOBACCO EXPOSURE AND ITS RELATIONSHIP TO NNAL + NNAL-GLUC AND COTININE LEVELS

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INTRODUCTION: NNK is a tobacco-specific carcinogen which occurs in levels of 1-2 µg per gram dry weight in moist snuff. NNK in combination with NNN, a related tobacco-specific carcinogen, causes oral tumors in rats and is believed to be involved in the production of oral cancer in humans. NNK is slowly eliminated from the body following tobacco cessation. Two metabolites of NNK, NNAL and NNAL-Gluc, can be observed in the urine of cigarette and smokeless tobacco users. Cotinine is a metabolite of nicotine. The urine or saliva levels of cotinine are an indication of the extent of tobacco exposure. Total nicotine + total cotinine assays provide a better gauge of exposure since it includes nicotine levels plus 3 major metabolites. A correlation has been previously shown for cotinine and NNAL + NNAL-Gluc in the urine of cigarette smokers. There has been little examination of the relationship between smokeless tobacco use and exposure to NNK and whether the dose relationship is more affected by the amount of tobacco used (tins per week) or the duration of exposure, i.e. how many minutes per day a user has a chew in their mouth.

METHODS: Smokeless tobacco users were recruited for a tobacco reduction study. Subjects completed a questionnaire which reviewed tobacco use history and current use patterns. Saliva cotinine was collected at baseline. A spot urine sample was also collected at baseline and analyzed for total nicotine + total cotinine and NNAL + NNAL-Gluc. Baseline tobacco use patterns were examined including the number of tins used per week and total daily dipping minutes (amount of time each dip was kept in the mouth multiplied by the number of dips per day). These use patterns were then examined for their relationship to NNAL + NNAL-Gluc and to cotinine levels. All biomarker results were skewed and a natural logarithm transformation was applied prior to analysis.

RESULTS: Subjects (n=25) used an average of 3.9 tins per week. The total daily dipping minutes of smokeless tobacco use was 464.5 minutes (\pm 292.1). Tins per week was not associated with NNAL + NNAL-Gluc ($r=.011$; $p=.65$), total nicotine + total cotinine in urine ($r=.04$; $p=.87$) or salivary cotinine ($r=.30$; $p=.14$). However, total daily dipping minutes per day was correlated to NNAL + NNAL-Gluc ($r=.43$, $p < .05$), total nicotine + total cotinine ($r=.44$, $p < .03$), and salivary cotinine levels ($r=.50$; $p=.01$).

CONCLUSIONS: The duration of the mouth's daily exposure to smokeless tobacco, rather than simply the number of tins of smokeless tobacco used per week provides a better understanding of carcinogen and nicotine metabolite levels in smokeless tobacco users.

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